

Remarks

The Office Action dated May 27, 2010, has been received and carefully reviewed. The preceding amendments and the following remarks form a full and complete response thereto.

Claims 1-16 and 19-27 have been amended. Claim 6 has been amended to specify that “welding by the laser beam is combined with welding by the GMAW head in such a way that the laser beam and the GMAW are weld simultaneously during movement of the orbital carriage.” Support for this amendment can be found, for example, in the specification at ¶ 0048. Claims 1-5, 7-16 and 19-27 have been amended as to matters of form. No new matter has been added.

Accordingly, claims 1-16 and 19-27 are pending in the present application and are submitted for reconsideration.

Rejection of Claims under 35 U.S.C. § 112

Claims 1-5 and 10-16 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. Applicants respectfully traverse the rejections for the following reasons.

Claims 1-5

The Office alleged that there was insufficient antecedent basis for the terms “the orbital position” and “the high-power laser beam source” of claim 1. Final Office Action at p. 2. Despite it being inherent that an orbital carriage has an orbital position, solely to expedite prosecution, Applicants have amended claim 1 to replace “the orbital position” with “an orbital position.” In addition, Applicants have amended claim 1 to provide antecedent basis for “the high-power laser beam source.” Accordingly, Applicants respectfully submit that claims 1-5 are definite and respectfully request reconsideration and withdrawal of the rejections.

Claim 9

Although claim 9 was not included in the statement of the indefiniteness rejection, the Office alleged “the speed of advance of the orbital carriage” lacked antecedent basis. Final Office Action at p. 3. Although an orbital carriage arguably inherently has a speed of advance even if the speed of advance is zero, solely to expedite prosecution, Applicants have amended claim 9 to replace “the speed of advance of the orbital carriage” with “the orbital carriage’s speed of advance.” Accordingly, Applicants respectfully submit that claim 9 is definite and, if there is an indefiniteness rejection of claim 9, respectfully request reconsideration and withdrawal of the rejection.

Claims 15 and 25

The Office found the phrase “can be” and the term “substantially” in claims 15 and 25 to render the claims indefinite. Final Office Action at p. 3. Applicants have amended claims 15 and 25 to delete “can be” and “substantially” from the claims. Accordingly, Applicants respectfully submit that claims 15 and 25 are definite and respectfully request reconsideration and withdrawal of the rejections.

Claims 16 and 26

The Office found it unclear whether “Transport vehicle” recited in claims 16 and 26 is the same as the “transport vehicle” recited in claims 15 and 25, respectively. Final Office Action at p. 3. Applicants have amended claims 16 and 26 to depend from claims 1 and 6, respectively, instead of claims 15 and 25, respectively, to remove any confusion regarding the “transport vehicle” recited in claims 15 and 25. Accordingly, Applicants respectfully submit that claims 16 and 26 are definite and respectfully request reconsideration and withdrawal of the rejections.

In addition, the Office asserts that, “[s]ince both claims 15 and 26 are directed to ‘Orbital welding device’, the preamble of claims 16 and 26 should be directed to the orbital welding device as well. As noted above, Applicants have amended claims 16 and 26 to depend from claims 1 and 6, respectively, which are each directed to an orbital welding device. However, the preambles of claims 16 and 26 are not required to be directed to an orbital welding device, and there is no basis for the Office’s assertion that they “should be.” To be clear, claims 16 and 26 are each directed to a “transport vehicle.” In particular, claims 16 and 26 are directed to a “transport vehicle” of the “orbital welding device” of claims 1 and 6, respectively. Applicants again respectfully submit that claims 16 and 26 are definite and respectfully request reconsideration and withdrawal of the rejections.

Rejection of Claims 1-5, 9-16 and 19-27 under 35 U.S.C. § 103

Claims 1-5, 9-16 and 19-27 were rejected under 35 U.S.C. § 103(a) as being as being unpatentable by reason of obviousness over U.S. Patent No. 5,227,601 to Black (“Black”) in view of Japanese Patent No. 2-127974 to Motoi *et al.* (“Motoi”) and further in view of Japanese Patent No. 8-267242 to Imanaga *et al.* (“Imanaga”) and further in view of U.S. Patent No. 5,601,735 to Kawamoto *et al.* (“Kawamoto”). Applicants respectfully traverse the rejections and submit that the claims are patentable for the following reasons.

Independent Claim 1

Claim 1, upon which claims 2-5, 10, 12-16 and 20 depend, is drawn to an orbital welding device for mobile use for joining a first pipe end and a second pipe end along a circumferential joint by means of at least one weld seam. In particular, the orbital welding device is for producing a pipeline to be laid on land. The orbital welding device comprises at least a guide

ring, an orbital carriage, a feed device, a welding head, a connecting line, a mobile welding device, an orbital position sensor and a first process parameter control. The guide ring is oriented relative to the first pipe end and the circumferential joint. The orbital carriage is displaceably guided at least along a section of the guide ring. The feed device is configured to move the orbital carriage under motor power along the guide ring. The welding head is arranged on the orbital carriage in alignment with the circumferential joint so that, by moving the orbital carriage, the weld seam is produced at least along a section of the circumferential joint. **The mobile welding device is positioned a distance away from the orbital carriage and is connected via the connecting line to the welding head.** The mobile welding device provides the power required for producing the weld seam. **The orbital position sensor is configured to detect an orbital position of the orbital carriage.** The welding device is a high-power laser beam source. A laser beam is produced by means of the high-power laser beam source. The connecting line is a waveguide is configured to guide the laser beam to the orbital carriage. The welding head is a laser welding head is configured to direct the laser beam into a laser welding zone and for the consequent production of the weld seam. **The first process parameter control is connected to the orbital position sensor and at least to the high-power laser beam source in such a way that laser radiation parameters are automatically adapted as a function of the orbital position of the orbital carriage.**

Fig. 4 (reproduced below) of Applicants' Specification illustrates one possible embodiment of an orbital welding device having "a mobile welding device ... positioned a distance away from the orbital carriage and is connected via the connecting line to the welding head," as recited in claim 1. In the example shown in Fig. 4, the illustrated orbital welding

device has a transport vehicle 35 positioned a distance away from orbital carriage 7 and is connected via waveguide 11 of tube bundle 50 to laser welding head 12.

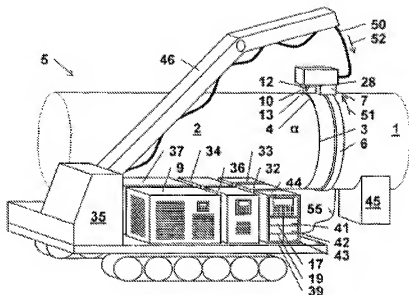
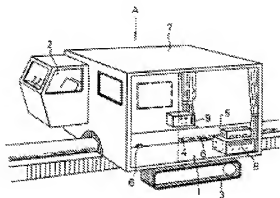


Fig. 4

Applicants respectfully submit that claim 1 is patentable over Black, Motoi, Imanaga and Kawamoto because the cited references, alone or in combination, do not teach or suggest each and every feature of claim 1. For example, the cited references neither teach nor suggest “a mobile welding device which is positioned a distance away from the orbital carriage and is connected via the connecting line to the welding head and provides the power required for producing the weld seam,” as recited in claim 1.

The Office acknowledges that Black fails to disclose this feature. Final Office Action at pp. 4-5. Instead, the Office relies on Motoi as “teach[ing] a mobile welding vehicle or transport vehicle which is a distance away from the orbital carriage” and on Imanaga as “teach[ing] a connecting line to the welding head.” *Id.*

Motoi discloses mobile welding equipment A with a casing with roof 7 and welding machine 8 provided therein. Motoi at Abstract and Figure (reproduced below). As the welding machine 8 of Motoi is provided **within** mobile welding equipment A of Motoi, the mobile welding equipment A is **not** positioned a **distance away** from the welding machine 8. Accordingly, Motoi fails to teach or suggest “a mobile welding device which is positioned a **distance away** from [an] orbital carriage,” as is recited in claim 1. (emphasis added).



Furthermore, because the welding machine 8 of Motoi is provided **within** mobile welding equipment A of Motoi, the mobile welding machine A is **not connected via a connecting line** to a welding head of welding machine 8. Accordingly, Motoi fails to teach or suggest a “mobile welding device which ... is **connected via the connecting line** to the welding head,” as recited in claim 1. (emphasis added).

Imanaga also does not teach or suggest “a mobile welding device which is positioned a distance away from the orbital carriage and is connected via the connecting line to the welding head and provides the power required for producing the weld seam,” as recited in claim 1. Fig. 1 of Imanaga shows a welding drive controller 11 connected to welding control head 9 and a sensor image processing device 22 connected to a sensor head 21, but nothing in Imanaga teaches or suggests that the welding drive controller 11 or sensor image processing device 22 is

mobile. Thus, Imanaga fails to teach or suggest “a mobile welding device which ... is **connected via the connecting line** to the welding head,” as recited in claim 1. (emphasis added).

Therefore, the cited references fail to teach or suggest “a mobile welding device which is positioned a distance away from the orbital carriage and is connected via the connecting line to the welding head and provides the power required for producing the weld seam,” as recited in claim 1, and Applicants respectfully submit that the rejection of claim 1 is improper.

In addition, the cited references do not teach or suggest:

- an orbital position sensor configured to detect an orbital position of the orbital carriage and
- **a first process parameter control ... connected to the orbital position sensor and at least to the high-power laser beam source in such a way that laser radiation parameters are automatically adapted as a function of the orbital position of the orbital carriage,**

as recited in claim 1. (emphasis added).

The Office acknowledges that Black fails to disclose this feature and instead relies on Imanaga. Final Office Action at pp. 4-6. Imanaga discloses a welding control head 9 that runs on a rail 10. Imanaga at ¶ 0041 and Fig. 1. The positions of obstacles in the form of groove blocks 3, which cross the weld line in order to fix the two pipe sections relative to each other which pipe sections are to be welded together, are detected. *Id.* at Abstract. The method of Imanaga interrupts the welding process when the welding torch 6 of welding control head 9 approaches a groove block 3, jumps the groove block 3 and continues welding after passing the groove block 3. *Id.* at Fig. 8. As a result, a weld seam is produced between the groove blocks 3 in a first step, and the pipe sections are fixed to each other. *Id.* at Abstract. The groove blocks can then be removed, and the weld seam is completed at the sites where the groove blocks had been positioned. *Id.*

However, Imanaga's disclosure of jumping a welding torch 6 over groove blocks is not a teaching or a suggestion of automatically adapting "**laser radiation parameters** ... as a function of the orbital position of the orbital carriage," as recited in claim 1. Accordingly, Imanaga fails to teach "that laser radiation parameters are automatically adapted as a function of the orbital position of the orbital carriage," as recited in claim 1, and Applicants respectfully submit that the rejection is improper.

Further, Kawamoto, on which the Office relies as teaching laser welding, also does not teach or suggest this feature. Kawamoto discloses a control unit 101 for controlling a welding head 102, an optical feeding reel 103 and a laser oscillator 104. Kawamoto at col. 8, lines 20-30 and Fig. 10. Kawamoto also discloses position sensors 201-1, 201-2, 201-3 and 201-4 that detect the orbital position of work head 18B. Kawamoto at col. 13, lines 10-38. Control unit 101 of Fig. 10 of Kawamoto is **not connected** to the position sensors 201-1, 201-2, 201-3 and 201-4 of Figs. 21 and 22 of Kawamoto, as required by the claim, because the two are not even disclosed in the same embodiment of Kawamoto. See Kawamoto at col. 8, lines 16-19 and col. 11, lines 11-12.

Plus, Kawamoto does not teach or suggest that **laser radiation parameters** are **automatically adapted** as a function of the orbital position of work head 18B. To the contrary, control unit 101 has nothing do with position sensors 201-1, 201-2, 201-3 and 201-4, and the position sensors 201-1, 201-2, 201-3 and 201-4 have nothing to do with the laser radiation parameters of Kawamoto. Instead, Kawamoto discloses that "position sensors 201-1, 201-2, 201-3 and 201-4 are provided around the outer circumferential guide 5B for detecting the position of the work head 18B in order to prevent interference between the laser beam and the tubular barrel supporting device 102B." Kawamoto at col. 13, lines 18-22. In response to a

position signal from the position sensors 201-1, 201-2, 201-3 and 201-4 indicating that the work head 18B has come to a position in which a leg of the tubular barrel supporting device 102B would interfere with the laser beam, control unit 101B lowers the leg of the tubular barrel supporting device 102B to prevent the interference. As the raising and lowering of legs of the tubular barrel supporting device 102B is not the adaption of a laser radiation parameter, Kawamoto does not disclose that “laser radiation parameters are automatically adapted as a function of the orbital position of the orbital carriage,” as required by amended claim 1.

At least because none of the cited references teach or suggest the “orbital position sensor” and “a first process parameter control” as claimed, the rejection of claim 1 is improper. Moreover, Applicants note that, by the automatic adapting of the laser radiation parameters as a function of the orbital position, the influence of gravity may be compensated. For instance, the welding situation when welding at the top of a horizontally laying pipe is different than the welding situation when welding at the underside of the pipe. Laser radiation parameters may be automatically adapted as a function of the orbital position to produce equal quality seams at all points of the orbit of the weld seam. The cited references teach or suggest nothing like this.

Accordingly, Applicants respectfully submit that claim 1 is patentable over the cited references and respectfully request reconsideration and withdrawal of the rejection.

Dependent Claims 2-5, 10, 12-16 and 20

Claims 2-5, 10, 12-16 and 20 depend, directly or indirectly, on independent claim 1 and are patentable over the combination of Black, Motoi, Imanaga and Kawamoto for the same reasons discussed above with regard to claim 1 as well as for additional limitations they recite.

Dependent Claims 9, 11, 19 and 21-27

Claims 9, 11, 19 and 21-27 depend, directly or indirectly, on independent claim 6 because, as acknowledged by the Office, the combination of Black, Motoi, Imanaga and Kawamoto does not teach or suggest each and every feature of claim 6. *See* Final Office Action at p. 7 (“Black in view of Motoi, Imanaga, and Kawamoto disclose all of the limitations [of claim 6] **except for a gas metal arc welding (GMAW) head and its components.**” (emphasis added)). Accordingly, Applicants respectfully submit that claims 9, 11, 19 and 21-27 for the same reasons acknowledged by the Office with respect to claim 6 as well as for additional limitations they recite.

Rejection of Claims 6-8 under 35 U.S.C. § 103

Claims 6-8 were rejected under 35 U.S.C. § 103(a) as being as being unpatentable by reason of obviousness over Black in view of Motoi and further in view of Imanaga and further in view of Kawamoto and further in view of U.S. Patent No. 5,932,123 to Marhofer *et al.* (“Marhofer”). Applicants respectfully traverse the rejections and submit that the claims are patentable for the following reasons.

Independent Claim 6

Claim 6, upon which claims 7-9, 11, 19 and 21-27 depend, is drawn to an orbital welding device for mobile use for joining a first pipe end and a second pipe end along a circumferential joint by means of at least one weld seam. The orbital welding device comprises at least a guide ring, an orbital carriage, a feed device, a welding head, a connecting line, and a mobile welding device. The guide ring is oriented relative to the first pipe end and the circumferential joint. The

orbital carriage is displaceably guided at least along a section of the guide ring. The feed device is configured to move the orbital carriage under motor power along the guide ring. **The welding head is arranged on the orbital carriage** in alignment with the circumferential joint so that, by moving the orbital carriage, the weld seam is produced at least along a section of the circumferential joint. The mobile welding device is a distance away from the orbital carriage and is connected via the connecting line to the welding head. The mobile welding device provides the power required for producing the weld seam. The welding device is a high-power laser beam source. A laser beam is produced by means of the high-power laser beam source. The connecting line is a waveguide configured to guide the laser beam to the orbital carriage. The welding head is a laser welding head configured to direct the laser beam into a laser welding zone and for the consequent production of the weld seam. A gas metal arc welding (GMAW) head is arranged indirectly or directly on the orbital carriage. The connecting line includes a GMAW power line, a GMAW process gas line, and a GMAW wire feed line. A GMAW power source is a distance away from the orbital carriage and is connected via the GMAW power line to the GMAW head for forming the GMAW arc. A GMAW process gas store is a distance away from the orbital carriage and is connected via the GMAW process gas line to the GMAW head for supplying the GMAW process gas. And, **welding by the laser beam is combined with welding by the GMAW head in such a way that the laser beam and the GMAW arc weld simultaneously during movement of the orbital carriage.**

Applicants respectfully submit that claim 6 is patentable because the cited references, alone or in combination, do not teach or suggest each and every feature of claim 6. For example, none of the cited references teach or suggest that “welding by the laser beam is combined with

welding by the GMAW head in such a way that the laser beam and the GMAW arc weld simultaneously during movement of the orbital carriage,” as recited in claim 6.

In the proposed combination of Black, Motoi, Imanaga and Kawamoto, the Office relies on Kawamoto as teaching a laser beam source and waveguide in a welding system and alleges that “[i]t would have been obvious ... to modify Black with laser beam source and waveguide of Kawamoto.” *See* Final Office Action at p. 6. The Office acknowledges that the combination of Black, Motoi, Imanaga and Kawamoto does not disclose “a gas metal arc welding (GMAW) head and its components.” *Id.* at p. 7. Instead, the Office relies on Marhofer as “teach[ing] a gas metal arc welding (GMAW) head and its components,” and alleges that “[i]t would have been obvious ... to modify Black in view of Motio, Imanaga, and Kawamoto with a gas metal arc welding (GMAW) head and its components of Marhofer.” *Id.* Thus, in the proposed combination of Black, Motoi, Imanaga, Kawamoto and Marhofer, the laser beam source and waveguide of Kawamoto and the GMAW head of Marhofer are **combined in some undefined manner** in a welding system.

Even assuming arguendo that it would have been obvious to **somehow combine** the laser beam source and waveguide of Kawamoto and the GMAW head of Marhofer, it would not have been obvious for “welding by the laser beam [to be] **combined** with welding by the GMAW head **in such a way that the laser beam and the GMAW arc weld simultaneously during movement of the orbital carriage**,” as recited in claim 6. (emphasis added). The welding with the laser beam of Kawamoto is neither taught nor suggested as being performed simultaneously with GMAW welding. Likewise, the GMAW welding of Marhofer is neither taught nor suggested as being performed simultaneously with laser beam welding. None of the cited prior art, alone or in combination, teach or suggest simultaneously welding with a laser beam and

GMAW arc during movement of an orbital carriage, and, as such, it would not have been obvious to one of ordinary skill in the art at the time of the invention to so.

Accordingly, Applicants respectfully submit that claim 6 is patentable over the cited references and respectfully request reconsideration and withdrawal of the rejection.

Dependent Claims 7 and 8

Claims 7 and 8 depend on independent claim 6 and are patentable over the cited references for the same reasons discussed above with regard to claim 6 as well as for additional limitations they recite.

Conclusion

All of the stated grounds of rejection have been sufficiently addressed herein. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding rejections, and that they be withdrawn. Applicants submit that a full and complete reply has been made to the outstanding Office Action and, as such, the present application is in condition for allowance.

The Applicants respectfully petitioned for a three-month extension of time. Any fees for the extension together with any additional fees may be charged to Counsel's Deposit Account No. 02-2135.

If for any reason the Examiner determines that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact, by telephone, the Applicants' undersigned attorney at the indicated telephone number to arrange for an interview to expedite the disposition of this application.

Respectfully submitted,

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Date

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